

footing the true principles of geological science; his theory being, that by the uniform action of forces such as are now in operation, the visible crust of the earth has been evolved from previous states.

Lyell was not only a keen investigator of natural phenomena; he was also a shrewd observer of human nature, and his four interesting volumes of travel in America are full of clever criticism and sagacious forecasts. His mind, always fresh and open to new impressions, by sympathy drew towards it and quickened the enthusiasm of all who studied nature. Had he done nothing himself, he would have helped science on by the warmth with which he hailed each new discovery. How many a young geologist has been braced up for new efforts by the encouraging words he heard from Sir Charles, and how many a one has felt exaggeration checked and the faculty of seeing things as they are strengthened by a conversation with that keen sifter of the true from the false!

Though by nature most sociable and genial, yet Sir Charles often withdrew from society where the object of his life, the pursuit of science, was not promoted; but when anything interesting turned up he always tried to share his pleasure with all around. Many of us will remember the cheerful and hearty "Look here"—"Have you shown it to so and so?"—"Capital, capital."

The little wayside flower, and, from early happy associations, still more, the passing butterfly, for the moment seemed to engross his every thought. But the grandeur of the sea impressed him most; he never tired of wandering along the shore, now speaking of the great problems of earth's history, now of the little weed the wave left at his feet. His mind was like the lens that gathers the great sun into a speck and also magnifies the little grain we could not see before. He loved all nature, great and small.

Much we owe to Leonard Horner, himself a good geologist, for having inspired the young Charles Lyell. In after years, when already well known, Charles Lyell chose as his wife the eldest daughter of his teacher and friend. Many have felt the charm of her presence—many have felt the influence of the soul that shone out in her face; but few know how much science directly owes to her. As the companion of his life, sharing his labour, thinking his success her own, Sir Charles had an accomplished linguist who braved with him the dangers and difficulties of travel, no matter how rough; the ever-ready prompter when memory failed, the constant adviser in all cases of difficulty. Had she not been part of him she would herself have been better known to fame. The word of encouragement that he wished to give lost none of its warmth when conveyed by her; the welcome to fellow-workers of foreign lands had a grace added when offered through her. She was taken from him when the long shadows began to cross his path; but it was not then he needed her most. When in the vigour of unimpaired strength he struggled amongst the foremost in the fight for truth, then she stood by and handed him his spear or threw forward his shield. He had not her hand to smooth his pillow at the last, but the loving wife was spared the pain of seeing him die.

It doubtless occurred to many a one among the crowd who saw him laid to rest among the great in thought and

action, that he might have been eminent in many a line besides that he chose.

His was a well-balanced judicial mind, which weighed carefully all brought before it. A large type of intellect—too rare not to be missed. But it was well that circumstances did not combine to keep the young laird on his paternal lands among the hills of Forfarshire: it was well for science that he was induced to prefer the quieter study of nature to the subtle bandying of words or the excitement of forensic strife. Failing health had for some time removed him from debates. Still to the last his interest in all that was going on in the scientific world never failed, and nothing pleased him more than an account of the last discussion at the Geological Society, or of any new work done. As a man of science his place cannot be easily filled; while many have lost a kind, good friend.

THE "BESSEMER"

THIS novel steamer, upon the construction of which so much care and ingenuity have been expended, is expected to leave Hull for the Thames this week, and shortly will proceed upon her service between Dover and Calais. By experiments recently made at Hull, the power of the apparatus to put the ponderous saloon in motion alternately in opposite directions, has been fully established. It will no doubt be interesting to our readers if we place before them the following observations connected with the design of this vessel.

The chief objects of her designers, Mr. Bessemer and Mr. Reed, were—

1. To reduce the discomfort of the journey to a minimum.
2. To make her very swift, so that the time spent on the sea by her passengers should be as short as possible.
3. To ensure great steadiness among waves, both as to rolling and pitching.

Finally, to provide her with everything that can contribute to the comfort and convenience of the passengers.

All these points were carefully worked out and considered in connection with the limit imposed on her draught of water by the shallow harbour of Calais.

The *Bessemer* is a double-ended vessel, propelled by four large paddle wheels, two on each side. Each end for a length of about 48 ft. is kept low for the purpose of reducing the motions produced by the action of the wind and of the sea, while the middle portion (about 254 ft.) of her length is built sufficiently high to enable her to steam at a high speed against the worst seas she will meet. A rudder is fitted at each end with efficient means for locking, so that the *Bessemer* will be able to steam in either direction, and will not require to be turned round in harbour, and each rudder is worked by means of Messrs. Brown's patent hydraulic steering gear.

Her great peculiarity, however, is that she contains a large saloon 70 ft. long, designed by Mr. Bessemer, suspended in the middle of the ship in such a manner that it can be moved about a longitudinal axis parallel to the keel. The motion of this saloon, which would be set up if left free to move, when the ship rolled, will be governed by an hydraulic apparatus (the invention of Mr. Bessemer),

so that the floor of the saloon will, under all circumstances, be very nearly level.

The *Bessemer* is 350 ft. long, 40 ft. wide along the deck-beam, and 64 ft. wide across the paddle-boxes. She will be propelled at a speed of eighteen to twenty miles an hour by two pairs of engines of the collective indicated power of 4,600 horses. The centres of the two pairs of paddle wheels will be about 106 ft. apart.

The *Bessemer* saloon contains the main saloon, which is about 40 ft. long by 29 ft. wide, and 20 ft. high, six spacious retiring rooms, a refreshment room, lavatories, store rooms, &c. The decorations and fittings of the main saloon will be of the very best description, Mr. Bessemer having given this branch of the design his most careful attention. The retiring rooms, as well as the main saloon, are ventilated and heated by a very ingenious arrangement of fans, pipes, &c., which supply and exhaust air in an almost imperceptible manner.

Between the paddle-boxes on either side, and on the upper deck at the middle of the vessel, there are numerous private cabins for the accommodation of first-class passengers, and all of these cabins will be fitted up in a manner that will help to make the journey across the Channel as pleasant as possible. In addition to these, at one end of the vessel between the decks there is a fixed saloon about 52 ft. long, for second-class passengers. The luggage will be stowed in the hold at the opposite end of the ship to this fixed saloon, and two very ingeniously contrived hydraulic luggage cranes, fitted by Messrs. Brown, Bros., will be employed for lifting luggage off the pier and depositing it in the luggage hold, and *vice versa*, in a very expeditious manner.

The *Bessemer* saloon, however, will be by far the finest cabin that has ever been fitted in a ship. Its great size and height enables it to be ventilated imperceptibly, and will prevent passengers who use it from feeling the unpleasant sensations usually connected with going below. But one of the great advantages of this saloon is, that whatever motion the ship may take from the waves—and this, from the adaptation of her form to passivity among Channel waves, will be slight—the saloon will be practically free from it. It is in the middle of the ship as regards length and breadth, and the axis of rotation is at a height where there is least motion, so that as regards its position it is one in which the vertical and lateral motions produced in every part of the ship by the pitching and rolling will be small, and usually scarcely appreciable. The saloon also will have very little pitching motion, for the form of the vessel renders it impossible for the sea of the Straits of Dover to raise her low freeboard ends very considerably; and even the small effects produced at the ends of the ship will be reduced to about one-seventh at the extremities of the saloon.

From the foregoing remarks it is evident that everything that promises to secure the passengers immunity from sea-sickness has been provided. In the saloon rolling and pitching motions will not be inconveniently felt, and any lateral or vertical movements that may be set up in the ship (and these must be obviously small when the main features of the design for preventing them are taken into account) will only be communicated to the saloon to the extent to which they exist at that part of the vessel where they are necessarily small.

It was intended by Mr. Bessemer to keep the floor of the suspended saloon level by means of an automatic apparatus which involved both the principle of the gyroscope and of Barker's mill. Certain practical difficulties, however, have led him to abandon that idea for the more simple and less costly plan which we will now attempt to describe. Immediately outside one of the ends of the saloon, and attached to the frames of the vessel, there is a pair of powerful pumping-engines. These engines keep up a constant supply of water to a large cylindrical accumulator. The hydraulic pressure so obtained is transmitted through pipes which pass through the hollow axle supporting the nearest end of the saloon to a very ingeniously contrived cylindrical slide balanced valve, which is placed on the athwartship floor girders near the middle of the saloon. The hydraulic pressure is next transmitted through the valve and through another system of pipes to two tipping cylinders, which are fitted one on each side of the vessel at the middle of the length of the saloon. These cylinders have their lower ends attached to two very strong athwartship girders, while the upper ends of the piston-rods are connected to the lower side of the upper deck. It will be readily perceived that the forces necessary to keep the floor of the saloon level are exerted on the ends of the athwartship girders just mentioned by means of the two sets of tipping gear. The direction of application of the hydraulic pressure on the pistons in the tipping cylinders is governed by means of a system of levers connected with the equilibrium valve. Near the end of the primary lever, and on its upper side, is fixed a spirit-level, and the man whose duty it is to work this lever regulates the distance through which he elevates or depresses the primary lever, so as to keep the air-bubble as near as possible coincident with the central mark on the level. It is assumed by this arrangement that when the spirit-level is "well" the floor of the saloon will be level, whatever rolling motion the vessel herself may have; and since this level is placed near the centre of gravity of the vessel where the angular motion is generally least, there can be no doubt that the saloon will at all times be pretty uniformly level.

THE ENCYCLOPÆDIA BRITANNICA

The Encyclopædia Britannica. Ninth Edition. Edited by Prof. Spencer Baynes. Vol. I. A to ANA. (Edinburgh: Adam and Charles Black.)

THE first volume of the ninth edition of the "Encyclopædia Britannica" has just been issued, handsomely printed and copiously illustrated.

The first edition of this venerable work was announced rather more than a century ago, as it began to be published in parts in the year 1771. The projector of the work was an Edinburgh printer of the time, Mr. Colin M'Farquhar, and the editor and chief compiler was Mr. Smellie, also a printer. Another gentleman associated in the production of the work was Mr. Andrew Bell, a well-known Edinburgh engraver of the period.

The first edition ignored biographical, historical, and geographical matters; but these subjects were effectively introduced in the second edition, and have formed an important feature in subsequent issues. The second